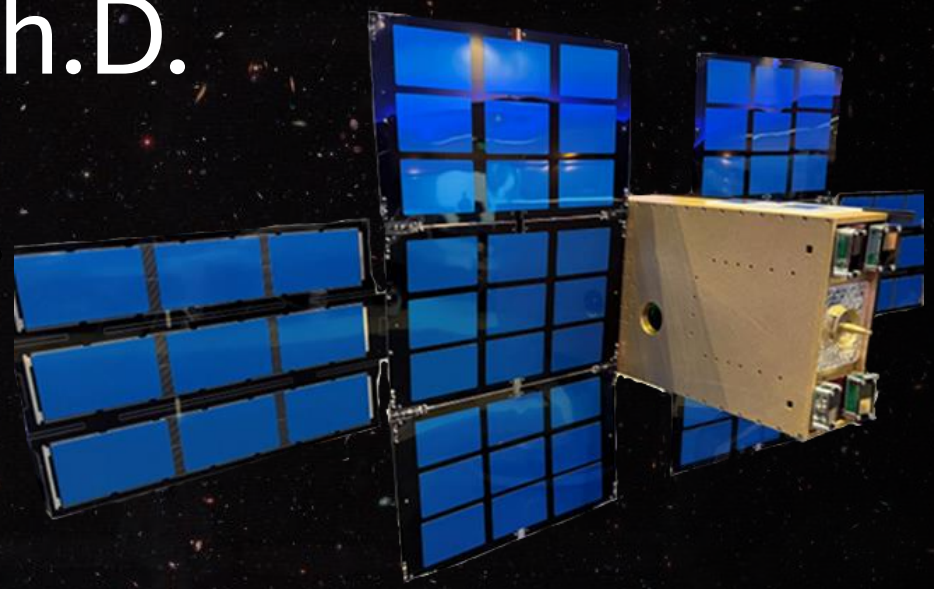
National Aeronautics and Space Administration

Green Propulsion Dual Mode (GPDM) Technology Demonstration Mission

Nehemiah Joel Williams, Ph.D.

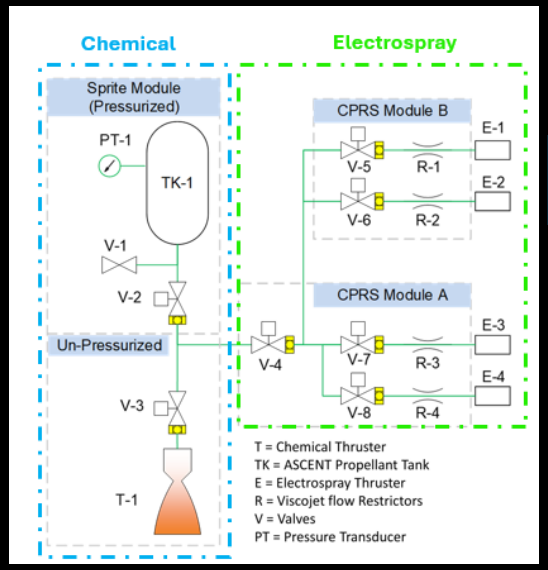
GPDM Project Manager
Marshall Space Flight Center (MSFC) /
Science & Technology Office (STO)



August 26, 2026

Mission Overview

GPDM Concept (2023)



GPDM SmallSat Flight System (2026)

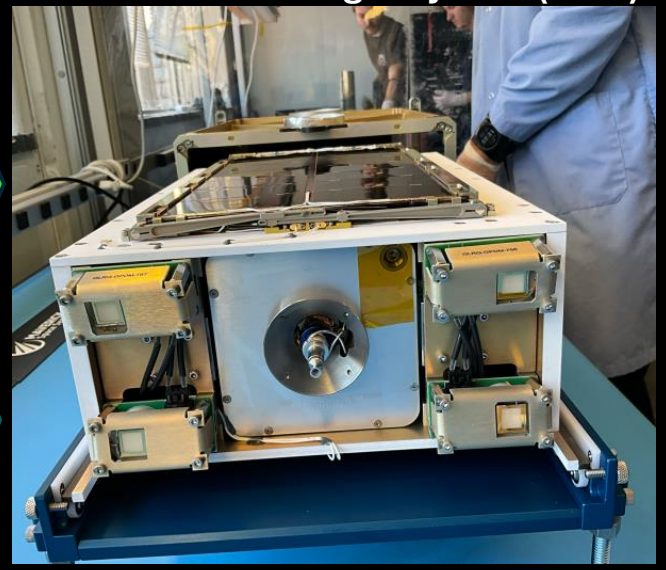


Image Credit: NASA (left)/Georgia Tech (GRLG)(right)

Mission Status:

- Completed integration, environmental testing, and propellant loading.
- Awaiting launch vehicle integration.

Shortfalls Addressed:

- Perform missions w/SmallSats beyond LEO (Need ID14.04).
- Transport s/c for missions in cis-lunar & deep space (Need ID 23.04).

Objectives and Significance

- GPDM's primary objectives include using the low-toxicity propellant known as AF-315E (ASCENT) in both modes of propulsion (chemical and electrospray) using a common propellant tank/feed system within the 6U CubeSat form factor.
- ASCENT/dual-mode technology offers relaxed constraints in size/weight/power for small spacecraft, as well as an extension in-space propulsion/delta-V capabilities which can fly various mission profiles vs. single mode propulsion potentially beyond LEO/cis-lunar space.

Funding Pathway

- MSFC Center Innovation Fund (CIF)
- NSTGRO (MIT)
- SBIR/STTR Phase III (Plasma Processes, E-Space)
- NASA University Grant Program (Georgia Tech)
- RTMD/SSDS Program (MSFC project management, systems engineering, component level development, testing)

Launch Information

- Date: October 1st, 2026
- Launch Location: Vandenberg Space Force Base
- Vehicle: Space X/Rideshare Transporter 18

Green Propulsion Dual Mode (GPDM) Technology Demonstration Mission

Mission Operations

- GPDM will deploy to a 510 km, near polar, sun-synchronous orbit over a total of 9 months in duration over 5 distinct mission phases.
- These mission phases include LEOP, dual-mode thruster commissioning, and several operation phases, and decommissioning.
- Dual-mode commissioning will focus on short chemical first and then electrospray burns to fully characterize the system.
- The operations phases will include longer electrospray burns as well as demonstrate orbital maneuvers including raising/lowering vehicle altitude during the operation.
- GPDM has partnered with NASA SCaN/KSAT to send/receive telemetry across 6 ground stations around the world; the flight system is operated at Georgia Tech's Mission Operations Center (MOC) .

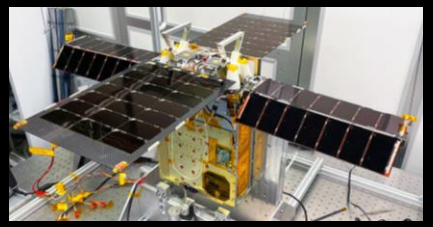
Milestones Met to Date

- Propellant loading (7/16)
- Dispenser integration (8/18)
- Transportation to launch facility (8/21)

Partners & Contributions

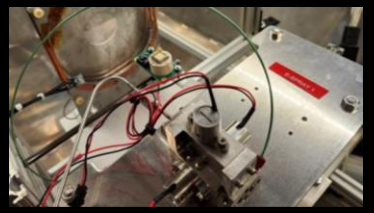
- **Georgia Tech:** Development and AI&T of the GPDM flight system, mission operations facility.
- **Plasma Processes, Inc.:** Chemical propulsion subsystem (thruster, prop tank, avionics).
- **Massachusetts Institute of Technology (MIT):** Electrospray thrusters.
- **E-Space:** Power Processing Unit (PPU), power for electrospray thrusters.

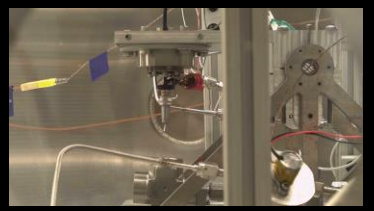
Green Propulsion Dual Mode (GPDM) Technology Demonstration Mission: 4 Years In One View



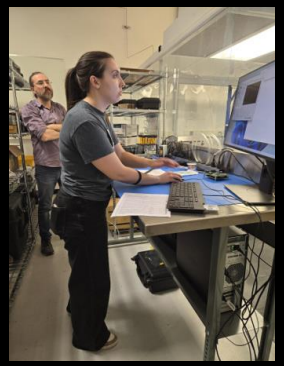
Lunar Flashlight Propulsion (2022)
- 4x ASCENT 0.1N Thrusters
- All chemical propulsion system

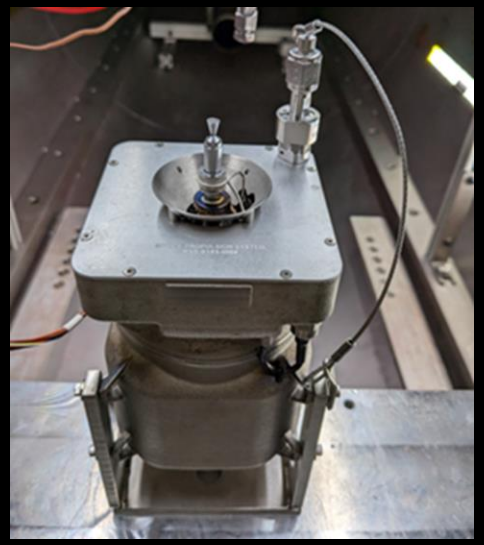
~~SPECTRE~~ GPDM (ATP in 2023)
- Existing LFPS 0.1 N thruster PLUS
- 4x electrosprays

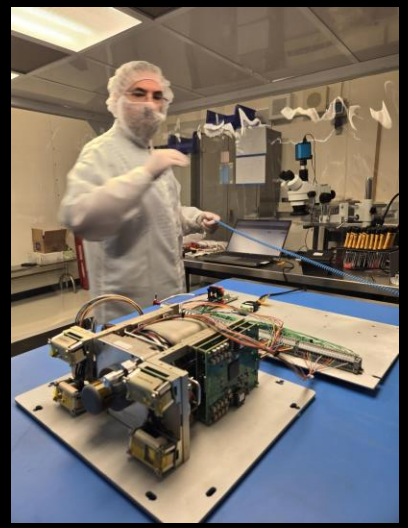






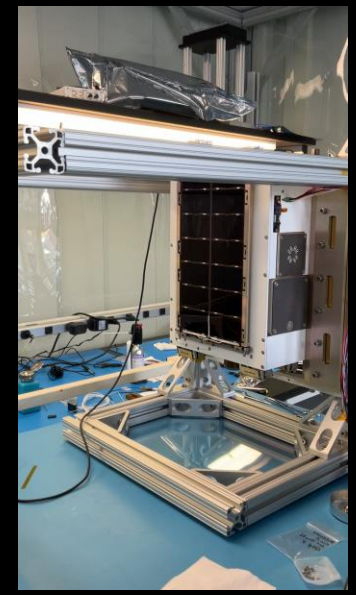














Pre-Formulation*

"System Requirements Review"

"Preliminary Design Review"

"Critical Design Review"

Pre-Ship Reviews

Flight Readiness Reviews/Flight

Concept Development & Component Level Testing

Flight System Design Reviews

Hardware Procurements/ Manufacturing

Assembly & Integration/Environmental Testing

2022 2023 2024 2025 2026

*Per NPR 7120.8, GPDM milestones reviews were tailored Periodic Project Assessments


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Exploring the secrets
of the universe for
the benefit of all.

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